

Orbital migration mechanism of Neptune

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The outer giant planets, Neptune pose a challenge to theories of planet formation. They exist in a region of the Solar system where long dynamical timescales and a low primordial density of conspired to make such large body very difficult.

And a large number of trans-Neptunian objects are found to have orbits that are commensurate with the 3:2 mean-motion resonance of Neptune's orbit. These objects were probably captured into this resonant configuration when proto-Neptune migrated outward from its cradle.

In Ida et al.(2000), they investigate the Neptune's migration mechanism, but they could not determine the direction.

We assume that Jupiter will determine the direction of Neptune's migration. So we investigate the motion of the planetesimals

under the gravitational effect of Jupiter, Neptune, and Sun using alpha-hermite integrator.

Our results are, Only inner of the Neptune's encounter zone will affect by Jupiter's gravity. Accordingly, planetesimals which scattered by Jupiter has a minimum angular momentum. So planetesimals swarm only can give the angular momentum to Neptune. This result indicate that Neptune will migrate outward.

We will show some quantitative calculation.